National Marine Fisheries Service
Endangered Species Act Section 7 Consultation
Biological Opinion and Magnuson–Stevens Act
Essential Fish Habitat Consultation

Action Agencies: National Marine Fisheries Service (NOAA Fisheries)
The U.S. Army Corps of Engineers (USACE)
The U.S. Bureau of Land Management (BLM)
The U.S. Environmental Protection Agency (EPA)
The U.S. Geological Survey (USGS)

Species/ESUs Affected: Threatened Oregon Coast (OC) Coho Salmon (*Oncorhynchus kisutch*) and Threatened Southern Oregon/Northern California Coast (SONCC) Coho Salmon.

Activities Considered:

1. Issuance of Permit No. 1140, Modification 3, to the Northwest Fisheries Science Center (NWFSC)
2. Issuance of Permit No. 1156, Modification 2, to the EPA
3. Issuance of Permit No. 1177, Modification 1, to the USACE
4. Issuance of Amended Permit No. 1256, to the BLM
5. Issuance of Amended Permit No. 1318 to the Oregon Department of Fish and Wildlife (ODFW)
6. Issuance of Amended Permit No. 1336 to the Port Blakely Farms (PBF)
7. Issuance of Permit No. 1358 to the ODFW
8. Issuance of Permit No. 1359 to the ODFW

Consultation Conducted by: The Protected Resources Division (PRD), Northwest Region, NOAA Fisheries. Consultation Number F/NWR/2001/01417.

Approved by: for D. Robert Lohn, Regional Administrator

Date: 8/29/02 (**Expires on:** December 31, 2006)

This Biological Opinion (Opinion) constitutes NOAA Fisheries' review of eight Endangered Species Act (ESA) section 10(a)(1)(A) permit actions affecting OC coho salmon and SONCC coho salmon. It has been prepared in accordance with section 7 of the ESA of 1973, as amended (16 U.S.C. 1531 et seq). This Opinion is based on information provided in the applications for proposed permits, comments from reviewers, published and unpublished scientific information on the biology and ecology of threatened salmonids in the action area, and other sources of information. A complete administrative record of this consultation is on file with the PRD in Portland, Oregon.

CONSULTATION HISTORY

NOAA Fisheries proposes to issue two new permits, three permit amendments, and three permit modifications authorizing scientific research studies on threatened OC coho salmon and SONCC coho salmon. The Northwest Region's PRD decided to group these actions into a single consultation pursuant to 50 CFR 402.14(c) because they are similar in nature and duration, occur in similar locations, and will affect the same threatened species. This Opinion constitutes formal consultation and an analysis of effects solely for the threatened species listed above. Some of the proposed research activities may affect ESA-listed species under the jurisdiction of the U.S. Fish and Wildlife Service (e.g., threatened bull trout (*Salvelinus confluentus*)). Permit applicants are required to obtain a take authorization from the U.S. Fish and Wildlife Service (USFWS) if ESA-listed species under its jurisdiction are expected to be encountered. The consultation histories for each of the permits are summarized below.

Permit No. 1140 Mod 3—for the NWFSC.

On December 22, 1999, the PRD received a request to modify Permit 1140 from the NWFSC in Seattle, Washington. The PRD subsequently received three more modification requests: on January 31, 2000, to incorporate newly listed species; on April 4, 2000, to recalculate take based on revised abundance estimates; and on April 16, 2000, to incorporate new personnel and research activities.

Permit No. 1156 Mod 2—for the EPA.

On April 7, 2000, the PRD received a request to modify Permit 1156 from the EPA/Dynamac in Corvallis, Oregon. Subsequently, on April 10, 2002, the PRD received another modification request which would allow the EPA/Dynamac to expand the scope of the project. Dynamac Corporation is a cooperator with the scientific research and its biologists are authorized to act as agents of the EPA in conducting the research.

Permit No. 1177 Mod 1—for the USACE

On March 12, 2002, the PRD received a request to modify Permit 1177 from the USACE in Portland, Oregon. ODFW is an authorized agent of the USACE in conducting research and enhancement activities.

Permit No. 1256 Amendment—for the BLM.

On March 13, 2000, the PRD received a permit application from the BLM in Eugene, Oregon. The PRD subsequently asked for, and received on June 29, 2001, additional information on specific locations where the proposed activities would be conducted.

Permit No. 1318 Amendment—for the ODFW.

On February 8, 2001, the PRD received a permit application from the ODFW in Portland, Oregon. A revised application was received on February 6, 2002.

Permit No. 1336 Amendment—for the PBF.

On December 14, 2000, the PRD received an application for a permit from the PBF in Tumwater, Washington.

Permit No. 1358—for the ODFW.

On February 1, 2001, the PRD received an application for a permit from the ODFW in Portland, Oregon.

Permit No. 1359—for the ODFW.

On July 27, 2001, the PRD received an application for a permit from the ODFW in Portland, Oregon.

DESCRIPTION OF THE PROPOSED ACTIONS

Common Elements Among the Proposed Actions

NOAA Fisheries proposes that all eight of the permit actions considered in this Opinion should be in effect until December 31, 2006. Some of the activities identified in the proposed permit actions will be funded by Federal agencies; these are NOAA Fisheries, the USACE, and the BLM. These agencies are also responsible for complying with section 7 of the ESA because they are funding activities that may affect ESA-listed species or their designated critical habitats. This consultation considers the activities they propose to fund and will fulfill their section 7 consultation requirement.

Also, in all instances where a permit holder does not expect to indirectly kill any listed fish during the course of his or her work, the indirect lethal take figure has been set at one fish. The reason for this is that, on occasion, unforseen circumstances can arise and NOAA Fisheries has determined it is best in these instances to include modest overestimates of expected take. By doing this, NOAA Fisheries gives researchers enough flexibility to make in–season research protocol adjustments in response to annual fluctuations in environmental conditions—such as water flows, larger than expected run sizes, etc.—without having to shut down the research because the expected take was exceeded. Also, high take estimates are useful for NOAA Fisheries to conservatively analyze the effects of the actions, as it allows accidents that could cause higher–than–expected take to be included in the analysis.

Research permits list general and special conditions to be followed before, during, and after the research activities are conducted. These conditions are intended to: (a) manage the interaction between scientists and ESA–listed salmonids by requiring that research activities be coordinated among permit holders and between permit holders and NOAA Fisheries; (b) require measures to minimize impacts on target species; and (c) report to NOAA Fisheries information on the effect the permitted activities have on the species of concern. The following conditions are common to all of the permits. In all cases, the permit holder must:

1. Anesthetize each ESA–listed fish that is handled out–of–water. Anesthetized fish must be allowed to recover (e.g., in a recovery tank) before being released. Fish that are simply counted must remain in water and do not need to be anesthetized.

2. Handle each ESA-listed fish with extreme care and keep them in water to the maximum extent possible during sampling and processing procedures. The holding units must contain adequate amounts of well-circulated water. When using gear that captures a mix of species, ESA-listed fish must be processed first to minimize the duration of handling stress. The transfer of ESA-listed fish must be conducted using a sanctuary net to prevent the added stress of an out-of-water transfer.

3. Stop handling ESA–listed juvenile fish if the water temperature exceeds 70 degrees Fahrenheit at the capture site. Under these conditions, ESA-listed fish may only be identified and counted.

4. Use a sterilized needle for each individual injection when using a passive integrated transponder tag (PIT-tag) to mark ESA-listed fish. This is done to minimize the transfer of pathogens between fish.

5. Notify NOAA Fisheries in advance of any changes in sampling locations or research protocols, and obtain approval before implementing those changes.

6. Not intentionally kill (or cause to be killed) any ESA–listed species the permit authorizes to be taken, unless the permit allows the ESA–listed species to be lethally taken.

7. Exercise due caution during spawning ground surveys to avoid disturbing, disrupting, or harassing ESA–listed adult salmonids when they are spawning. Whenever possible, walking in the stream must be avoided—especially in areas where ESA–listed salmonids are likely to spawn.

8. Use visual observation protocols instead of intrusive sampling methods whenever possible. This is especially appropriate when merely ascertaining whether anadromous fish are present. Snorkeling and streamside surveys will replace electrofishing procedures whenever possible.

9. Comply with NOAA Fisheries' backpack electrofishing guidelines when using backpack electrofishing equipment to collect ESA-listed fish.

10. Report to NOAA Fisheries whenever the authorized level of take is exceeded or if circumstances indicate that such an event is imminent. Notification should be made as soon as possible, but no later than two days after the authorized level of take is exceeded. Researchers must then submit a detailed written report. Pending review of these circumstances, NOAA Fisheries may suspend research activities or reinitiate consultation before allowing research activities to continue.

11. Submit to NOAA Fisheries a post-season report summarizing the results of the research. The report must include a detailed description of activities, the total number of fish taken at each location, an estimate of the number of ESA-listed fish taken at each location, the manner of take, the dates/locations of take, and a discussion of the degree to which the research goals were met.

Any additional permit conditions specific to each of the proposed research are included in the descriptions of the respective permits.

Finally, NOAA Fisheries will monitor actual annual takes of ESA-listed fish species associated with scientific research activities (as provided to NOAA Fisheries in annual reports or by other means) and shall adjust annual permitted take levels if they are deemed to be excessive or if cumulative take levels are determined to operate to the disadvantage of the ESA-listed species.

The Individual Permits

The ESA describes take to mean to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Each permit action requests to take one or both of the threatened species that are the subject of this Opinion. Activities proposed in the permit actions have been classified into the following categories (per the application instructions) and are defined as follows:

1. Observe/harass;
2. Collect for transport (including rescue/salvage);
3. Capture, handle, and release;
4. Capture, handle, tag, mark, tissue sample, and/or other invasive procedure, and release;
5. Direct lethal take (sacrifice);
6. Indirect lethal take (indirect mortality);
7. Removal (e.g., for broodstock collection); and,
8. Other take (any take not described above).

Some of the permit requests described in the following pages seek to take other listed salmonids along with those addressed in this Opinion (e.g., Puget sound chinook salmon). The effects of taking those other species are described in other biological opinions and are not relevant to this consultation. Therefore, only those portions of the proposed research activities that would affect OC and SONCC coho salmon are discussed here.

Permit 1140:

Permit 1140 (modification 3) would authorize the NWFSC to annually take juvenile OC coho during the course of research designed to assess the relationship between environmental variables, selected anthropogenic stresses, and bacterial and parasitic pathogens on mortality of juvenile salmon in selected coastal estuaries in Oregon. The results of the study will benefit ESA–listed species by providing a better understanding of how environmental factors influence disease transmission. The project is being coordinated with pathogen research being conducted by the NWFSC under permit 1290. The NWFSC proposes to capture (using seines and fyke nets) and kill up to 200 juvenile OC coho salmon. The corpses would be retained for research purposes or returned to the river.

Permit 1156:

Permit 1156 (modification 2) would authorize the EPA to annually take adult and juvenile OC and SONCC coho salmon associated with research designed to the assess status and trends of surface waters in the Pacific Northwest in a statistically and ecologically rigorous manner. The overall program is mandated by the Clean Water Act (CWA) and is expected to increase recovery potential for ESA–listed species in various rivers in the Pacific Northwest. The research will benefit ESA–listed fish by providing baseline information to support enforcement of the CWA in freshwater river systems where they may be present. Dynamac Corporation is a cooperator with the scientific research and its biologists are authorized to act as agents of the EPA in conducting the research. The EPA/Dynamac proposes to capture (using backpack or raft–mounted electrofishing), examine, and release 10 juvenile and two adult SONCC coho and five juvenile and two adult OC coho. Adult OC coho would be shocked but not netted during the activities. The EPA/Dynamac also requests a small amount of an indirect lethal take that may be associated with this research and that the Biological Resources Division of the USGS be allowed to act as the EPA's agent under the permit while conducting the research.

Permit 1177:

Permit 1177 (modification 1) would authorize the Portland District USACE to increase annual takes of adult and juvenile threatened SONCC coho salmon associated with research and an adult trap-and-haul program at Elk Creek Dam on the Rogue River in Oregon. The purpose of the trap-and-haul is to move returning SONCC coho above an impassable barrier so that the fish may use the habitat upstream for natural spawning. The purpose of the research is to evaluate the trap-and-haul by determining the annual spawning success of fish upstream of the dam. The trap-and-haul program and associated research will benefit listed coho by increasing their access to spawning habitat and thereby helping maintain or increase levels of natural coho production in the Elk Creek Basin. The USACE proposes to observe/harass 300 juvenile SONCC coho during snorkel surveys. The USACE also proposes to capture (using a weir below the dam), anesthetize, transport above the dam, mark with an opercle punch, allow to recover, and release 16,000 adult SONCC coho. Any adult salmon that fall below the dam will be recaptured to estimate the number of fish that pass downstream over the weir. In addition, up to 10 adult SONCC coho may be killed indirectly as a result of the trap and haul program, and 45 adult fish carcasses will be examined for evidence of spawning and immediately returned to the stream.

Permit 1256:

Permit 1256 (amendment) would authorize the BLM to annually take adult and juvenile OC coho salmon in the Smith and Siuslaw Rivers and their tributaries in Oregon. The purposes of the study are to: (1) Collect data on fish abundance and presence, adult escapement, and habitat needs prior to stream enhancement; (2) evaluate habitat restoration projects; (3) determine what non–salmonid species are present, (4) determine coho migration time and smoltification size in the study areas; and (5) perform watershed analysis. The study would benefit OC coho by determining how fish habitat alterations associated with management projects compare to natural changes. The BLM proposes to observe 1,000 juvenile OC coho by snorkeling during habitat surveys and 500 adults during spawning surveys. In addition, 1,500 juvenile OC coho will be captured (using backpack electrofishing, seining, dipnetting, and rotary trapping), handled, and released. A rotary trap will be used to capture 250 juveniles to be marked with a subcutaneous injection of colored dye with a Panjet needle-less injector. The BLM also requests lethal take for 10 juvenile OC coho that may be killed as an indirect result of the research.

Permit 1318:

Permit 1318 (amendment) would authorize the ODFW to annually take juvenile OC coho salmon during the course of conducting one of five separate scientific research projects. That is, of five proposed projects in the ODFW's research application only one (Study 2) would affect OC coho. The purpose of Study 2 is to determine trends in warmwater fish communities and answer long-term management questions for warmwater species in Oregon. The project will benefit listed OC coho by providing information on fish population structures and species interactions. This data, in turn, will be used to design and implement management actions that conserve and protect listed species. The ODFW proposes to capture, handle, and release 430 juvenile OC coho salmon while conducting boat electrofishing transects in warm and backwater habitats. The ODFW also requests take of 43 OC coho salmon that may be killed as an indirect result of this research.

Permit 1336:

Permit 1336 (amendment) would authorize the PBF to take juvenile OC coho salmon in various lakes, rivers, and creeks in Douglas and Coos counties in Oregon. The purpose of the study is to evaluate factors limiting fish distribution and water quality in water ways traversing property owned by PBF. The study would benefit listed fish by producing data that would be used to conserve and restore their habitat. The PBF proposes to capture (using backpack electrofishing and dipnetting), handle, and release 50 juvenile OC coho. The PBF is not requesting indirect mortality of ESA–listed fish.

Permit 1358:

Permit 1358 would authorize the ODFW to take juvenile SONCC coho salmon in index and randomly selected sites in the Rogue River Basin and other Oregon coastal basins. The purpose of the study is to monitor the abundance of SONCC coho salmon in accordance with the Oregon

Plan for Salmon and Watersheds. The study will benefit SONCC coho salmon by providing information on the species abundance and distribution. The ODFW proposes to capture (using backpack electrofishing, blocknetting, and dipnetting), handle, and release 1,400 juvenile SONCC coho salmon. The ODFW also requests take for 28 juvenile SONCC coho that may be killed as an indirect result of the research.

Permit 1359:

Permit 1359 would authorize the ODFW to take juvenile SONCC coho salmon associated with scientific research to be conducted at 168 sites in the Rogue River Basin. The purposes of the research are to: (1) Prioritize restoration efforts at fish passage barriers in Rogue Basin streams; (2) survey streams to determine the fish species below and above barriers; and (3) determine the severity of any fish passage problems. The research will characterize species distribution and identify fish passage improvement projects that will benefit wild fish populations. The ODFW proposes to capture (using backpack electrofishing, blocknetting, and dipnetting), identify, and release 146 juvenile SONCC coho. The ODFW also requests take for eight juvenile SONCC coho that may be killed as an indirect result of the research.

The Action Area

The action area is defined as the geographic extent of all direct and indirect effects of a proposed agency action [50 C.F.R. 402.02 and 402.14(h)(2)]. The proposed actions considered in this Opinion will affect two threatened species, OC coho salmon and SONCC coho salmon. For SONCC coho, this includes the species' designated critical habitat. Critical habitat consists of the water, substrate, and adjacent riparian zone of estuarine and riverine reaches in the hydrologic units and counties described in the critical habitat designation (May 5, 1999, 64 FR 24049, Table 6 (NOAA 1999)). The critical habitat designation for OC salmon was vacated and remanded to NOAA Fisheries for new rulemaking pursuant to a court order in May 2002. However, the action area for the proposed research will still take place in the area that was designated as critical habitat on February 16, 2000 (65 FR 7764 Table 15). Thus, in the absence of new rule designating critical habitat for OC coho salmon, this consultation will include an evaluation of the effects of the proposed actions on the species' habitat to determine whether those actions are likely to jeopardize the species' continued existence.

OC coho salmon

For the purposes of this Opinion, the action area includes all Oregon coastal river basins known to support this ESU from Cape Blanco north to the Columbia River. This habitat includes all river reaches and estuarine areas accessible to listed OC coho salmon from coastal streams south of the Columbia River and north of Cape Blanco, Oregon. Excluded are Tribal lands and areas above specific dams (NOAA 2000, Table 15) or above longstanding, naturally–impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). The following Oregon counties lie partially or wholly within these basins (or contain migration habitat for the species): Clatsop, Tillamook, Washington, Columbia, Yamhill, Benton, Lincoln, Polk, Lane, Douglas, Coos, Josephine, and Curry. More detailed habitat information (i.e., specific watersheds, migration barriers, habitat features, and special management considerations) for this ESU can be found in the critical habitat designation for OC coho salmon on February 16, 2000, (65 FR 7764 Table 15) which was vacated and remanded to NOAA Fisheries for new rulemaking pursuant to a court order in May 2002.

SONCC coho salmon

For the purposes of this Opinion, the action area includes Oregon coastal river basins known to support this ESU South of Cape Blanco to the Oregon—California border. Critical habitat is designated to include all river reaches and estuarine areas accessible to listed SONCC coho salmon between Cape Blanco, Oregon, and Punta Gorda, California. Excluded are areas above specific dams (NOAA 1999, Table 6) or above longstanding, naturally–impassable barriers (i.e., natural waterfalls in existence for at least several hundred years). The following counties lie partially or wholly within these basins (or contain migration habitat for the species): Klamath, Jackson, Douglas, Josephine, and Curry in Oregon, and Humbolt, Mendocino, Trinity, Glenn, and Del Norte in California. More detailed critical habitat information (i.e., specific watersheds, migration barriers, habitat features, and special management considerations) for this ESU can be found in the May 5, 1999, Federal Register notice.

STATUS OF THE SPECIES UNDER THE ENVIRONMENTAL BASELINE

In order to describe a species' status, it is first necessary to define precisely what "species" means in this context. Traditionally, one thinks of the ESA listing process as pertaining to entire species of animals or plants. While this is generally true, the ESA also recognizes that there are times when the listing unit must necessarily be a subset of the species as a whole. In these instances, the ESA allows a "distinct population segment" (DPS) of a species to be listed as threatened or endangered.

NOAA Fisheries developed the approach for defining salmonid DPSs in 1991 (Waples 1991). It states that a population or group of populations is considered a distinct population segment if they are ". . . substantially reproductively isolated from conspecific populations," and if they are considered ". . . an important component of the evolutionary legacy of the species." A distinct population or group of populations is referred to as an evolutionarily significant unit (ESU) of the species. The OC coho salmon and SONCC coho salmon ESUs are each considered DPSs and hence "species" under the ESA.

The OC coho salmon were listed as threatened in 1999 (64 FR 42591). The ESU comprises all naturally spawning populations south of the Columbia River and north of Cape Blanco, in Curry County, Oregon. The SONCC coho salmon were listed as threatened in 1997 (62 FR 24588). The ESU comprises all naturally spawning populations in streams south of Cape Blanco, Oregon, and north of Punta Gorda in Humboldt County, California.

Threatened OC and SONCC coho salmon were listed under the ESA because NOAA Fisheries determined that a number of factors, both environmental and demographic, had caused them to decline to the point where they were likely to be in danger of going extinct within the foreseeable future. The factors for decline affect biological salmonid requirements at every life stage and arise from a number of different sources. This section of the Opinion explores those effects and defines the context within which they occur.

Life Histories

In contrast to the life history patterns of other anadromous salmonids, coho salmon generally exhibit a relatively short and fixed 3-year life cycle. Juvenile life stages (i.e., eggs, alevins, fry, and parr) inhabit freshwater/riverine areas for up to 15 months throughout the range of the ESU. Parr undergo a smolt transformation typically in their second spring at which time they migrate to the ocean. Subadults and adults forage in coastal and offshore waters of the North Pacific Ocean prior to returning to spawn in their natal streams. Adults typically begin their spawning migration in the late summer and fall, spawn by midwinter, then die. Coho salmon typically spend two growing seasons in the ocean before returning to their natal stream to spawn as 3-year-olds. Some precocious males, or "jacks," return to spawn after only six months at sea (i.e., as 2-year-olds).

The life histories of OC coho and SONCC coho are similar enough that there is no need to differentiate between them for the purposes of this Opinion. For more information on coho salmon life histories and biology, please see Weitkamp et al. (1995) and NOAA Fisheries (1997).

Overview—Status of the OC and SONCC coho salmon

To determine a species' status under extant conditions (usually termed "the environmental baseline"), it is necessary to ascertain the degree to which the species' biological requirements are being met at that time and in that action area. For the purposes of this consultation, OC and SONCC coho salmon biological requirements are expressed in two ways: Population parameters such as fish numbers, distribution, and trends throughout the action area; and the condition of various essential habitat features such as water quality, stream substrates, and food availability. Clearly, these two types of information are interrelated. That is, the condition of a given habitat has a large impact on the number of fish it can support. Nonetheless, it is useful to separate the species' biological requirements into these parameters because doing so provides a more complete picture of all the factors affecting OC and SONCC coho salmon survival. Therefore, the discussion to follow will be divided into two parts: Species Distribution and Trends, and Factors Affecting the Environmental Baseline.

Species Distribution and Trends

<u>OC coho salmon</u>

The OC coho salmon ESU is defined as all naturally-produced populations of coho salmon (and their progeny) in Oregon coastal streams south of the Columbia River and north of Cape Blanco. The following river basins are known to support naturally spawning coho salmon: Necanicum River, Nehalem River, Tillamook Bay and tributaries, Nestucca River, Salmon River, Siletz River, Yaquina River, Beaver Creek, Alsea River, Yachats River, Siuslaw River, Siltcoos River, Tahkenitch Creek, Umpqua River, Tenmile Creek, Coos River, Coquille River, New River, and Sixes River (Weitkamp et al. 1995). Based on historic commercial landing numbers and estimated exploitation rates, a coho salmon escapement to coastal Oregon rivers was estimated to fall between one and 1.4 million fish in the early 1900s, and the harvest level at that time was nearly 400,000 fish (Mullen 1981, Lichatowich 1989). Recent (1996-2000) spawning escapement estimates using stratified random surveys give an annual average of 47,356 returning adults (ODFW 2000). Lichatowich (1989) attributed this decline to a nearly 50% reduction in habitat production capacity. Current production potential for coho salmon in coastal Oregon rivers has been estimated at about 800,000 fish using stock-recruit models (Lichatowich 1989). While the contrasting methods of estimating total returns make it difficult to compare historical and recent escapements, these numbers suggest that current abundance of coho salmon on the Oregon coast may be less than 5% of that in the early part of this century. The ODFW (1995) made estimates of coho salmon abundance at several points of time from 1900 to the present. These data show a decline of about 75% from 1900 to the 1950s and an additional 15% decline (to a total of about 90%) since the 1950s. However, though the overall trend has been distinctly downward throughout the century, it should be noted that OC coho populations are highly variable from year to year. From 1990 to 2000, OC coho abundance ranged from lows of 15,510 and 14,068 in 1990 and 1997, respectively, to highs of 59,453 and 52,678 in 1996 and 2000, respectively (ODFW 2000). In the year 2001, those number took a dramatic upswing to an estimated 149,058—the highest number in decades (ODFW 2002b). In general the trend over the course of the decade was an increasing one from very low numbers 1990 to a decadal high in 1996, a crash in 1997, and another increase until the big jump in 2001. It has yet to be seen whether the 2001 returns represent an anomaly or a genuine step down the path to recovery.

<u>SONCC coho salmon</u>

The three major river systems supporting coho in the SONCC ESU are the Rogue, Klamath (including the Trinity), and Eel Rivers. The Rogue River is the major river basin in the action area and it accounts for the majority of coho salmon production in the Oregon portion of the SONCC ESU. Of the 396 streams within the range of the California portion of the SONCC ESU that were identified as once having had coho salmon runs, recent survey information is available for 115 streams. Of these 115 streams, 73 still support coho salmon runs. The rivers and tributaries in the California portion of the SONCC ESU were recently estimated to have average total run sizes of 7,080 natural spawners and 17,156 hatchery returns. According to Brown et al. (1994), 4,480 were identified as native fish occurring in tributaries having little history of supplementation with non-native fish. South of Cape Blanco, Nehlsen et al. (1991) considered all but one coho salmon stock to be at "high risk of extinction." Nickelson et al. (1992a) rated all Oregon coho salmon stocks south of Cape Blanco as "depressed." Counts of adult coho salmon over Gold Ray Dam (Upper Rogue River) provide a historic view of this species' abundance. During the 1940s, counts averaged 2,000 adult coho salmon per year. Between the late 1960s and early 1970s, adult counts averaged fewer than 200. During the late 1970s, dam counts increased, corresponding with returning coho salmon produced at Cole Rivers Hatchery. Coho salmon run size estimates derived from seine surveys at Huntley Park near the mouth of the Rogue River ranged from 450 to 19,200 naturally-produced adults between 1979 and 1991. Recent estimates of naturally-produced adults returning to the Rogue River have been highly variable over the past five years. Though the annual river run sizes from 1997 to 2001 have averaged 7,043 natural fish, the range of the returns over that period runs from around 1,400 to more than 12,000 (ODFW 2002a).

Thus, the degree to which OC and SONCC coho salmon's biological requirements are being met with respect to population numbers is something of a mixed bag. Though they have consistently exhibited very low numbers compared to historic levels, it appears that recent trends are increasing ones, though relatively highly variable. However, their habitat (critical and otherwise) has shown a steady decrease in area and function since the turn of the 20th century and that trend continues. Therefore, while there is some cause for optimism, there has been no genuine change in the species' status since it was listed, and the most likely scenario is that its biological requirements are not being met with respect to abundance, distribution, and overall trend.

Factors Affecting the Environmental Baseline

Environmental baselines for biological opinions are defined by regulation at 50 CFR 402.02, which states that an environmental baseline is the physical result of all past and present state, Federal, and private activities in the action area along with the anticipated impacts of all proposed Federal projects in the action area (that have already undergone formal or early section 7 consultation). The environmental baseline for *this* Opinion is therefore the result of the impacts a great many activities (summarized below) have had on the survival and recovery of the listed salmonids under this Opinion. Put another way (and as touched upon previously), the baseline is the culmination of the effects that multiple activities have had on the species' *biological requirements* and, by examining those individual effects, it is possible to derive the species' status in the action area.

Many of the biological requirements for OC coho salmon and SONCC coho salmon in the action area can best be expressed in terms of the essential features of their habitat. That is, the coho salmon require adequate: (1) substrate (especially spawning gravel), (2) water quality, (3) water quantity, (4) water temperature, (5) water velocity, (6) cover/shelter, (7) food, (8) riparian vegetation, (9) space, and (10) migration conditions (NOAA Fisheries 1999). The best scientific information presently available demonstrates that a multitude of factors, past and present, have contributed to the decline of west coast salmonids by adversely affecting these essential habitat features.

Please note that the discussion here constitutes an overview of the factors affecting the environmental baseline for OC and SONCC coho salmon. For greater detail, please see Weitkamp et al. (1995), NOAA Fisheries (1996), and NOAA Fisheries (1997).

Human-Induced Habitat Degradation

The quality and quantity of freshwater habitat along much of the Oregon and California coasts have declined dramatically in the last 150 years. Forestry, farming, grazing, road construction, mining, and development have radically changed the historical habitat conditions in many river basins. Because coho salmon spend the first 15-20 months of their lives in riverine habitat, they are particularly vulnerable to the detrimental effects of current and past land management practices (NOAA Fisheries 1996). Some of those effects are outlined below.

Channel Morphology

"In many coastal streams, human activities have simplified or otherwise modified channel complexity, braidedness, and hydrologic connection to floodplains to the detriment of salmonids" (Coastal Salmonid Restoration Initiative (CSRI) 1997). Coho salmon require complex, stable habitat: large pools for spawning, rearing, and migration (pools provide velocity and thermal refuge, resting habitat, and other functions); large woody debris (LWD) for forming those pools, providing shelter from predators, reducing channel erosion, and other functions; stable banks for shelter, resting habitat, maintaining deeper, cooler channels, and other functions. All of these functions have been compromised in the range of OC and SONCC coho salmon by human activities such as farming, logging, road building, mining, in-filling, channelizing, water diversions, and so forth. The results have been that deep pools have been filled in by sediment created by these activities—streams on private lands in coastal Oregon have lost as much as much as 80% of their deep pool habitat (CSRI 1997); LWD has been removed—both directly, and indirectly by harvest regimes that cut down streamside standing trees; banks have been de-stabilized—again by tree harvest, along with road building, development, and mining activities; and streams have become warmer, wider, and less complex. All of these activities have had adverse impacts on OC and SONCC coho salmon.

Substrate

"In many coastal streams, human activities have resulted in the loss, redistribution, simplification, or burial of gravel/cobble substrates needed for salmon reproduction, or other modification of stream bed particle size and distribution to the detriment of salmonids" (CSRI 1997). Salmon need clean, coarse gravel in which to lay their eggs and safely spend their earliest development stages. Road-building, mining, timber harvest, development, agriculture, and urbanization have increased the amount of fine sediment found in the streams and rivers inhabited by OC and SONCC coho salmon (CSRI 1997). Some of this damage is incremental in the form of surface erosion, and some comes in the form of mass land movements triggered by timber harvest and other hillside-destabilizing activities. Sediment can bury and smother salmon eggs, alter a stream's food web, reduce pool volume, and reduce rearing and over-wintering habitat (Rhodes et al. 1994). SONCC and OC salmon have experienced all of these detrimental effects and more.

Estuarine and Wetland Habitat

"Diking, draining, and filling of estuaries has reduced the amount of estuarine habitat useable to meet salmonid life-history needs and may have changed how salmon interact with marine mammal and avian predators" (CSRI 1997). Estuaries are the areas in which coho salmon acclimatize to the ocean and, sometimes, spend the winter. They are also important components of the species' up-and downstream migration routes. Since Europeans arrived in the Pacific Norwest, it is estimated that 50% to 95% of the regions estuaries have been turned into farm land and urban zones (Boule and Bierly 1987 *in* Botkin et al. 1994). Along the Oregon coast, perhaps as much as 60% of the marshes have been diked or filled or both (Botkin 1994). In some areas the situation is worse. For example, the Coos Bay and Coquille River estuaries have been reduced by 90% and 96%, respectively (Botkin 1994). Wetland habitat—which provides salmonids with critical rearing, sheltering, and overwintering habitat—has seen similar decreases throughout the region. These losses of wetland and estuarine habitat have had a profound negative impact on OC and SONCC coho salmon.

Riparian Areas

Riparian areas are critical to maintaining healthy salmon populations. They help regulate water temperature through streamside shading, provide needed inputs of LWD, serve as the connection between upland food and nutrient sources and the stream, provide important microclimates for salmon food sources, help prevent excess sedimentation by stabilizing streambanks, and provide hydrologic connectivity with surface water. Salmon need riparian areas that function well in all of these areas. Unfortunately, in many areas of Western Oregon, the riparian habitat characteristics salmon require have been severely damaged or completely eliminated (Botkin 1994). As an example, in a survey of approximately 98% of the total stream milage in Oregon's coastal basins, the ODFW found "desirable" levels of large riparian conifers (critical for LWD recruitment) on only one percent of the non-Federal stream miles (CSRI 1997). About 70% of the total land in these basins is non-Federal. This loss is a direct result of long-term high logging and road building levels and the consequences—high water temperatures, greater degrees of siltation, decreasing stream complexity—have all been bad for salmon.

Water Quality and Quantity

Salmon need sufficient quantities of cold, clear water in order to survive. In portions of many coastal basins, these requirements are not being met. For instance, "water temperatures are too warm for salmonids in many coastal streams. Altered water temperatures can adversely affect spawning, fry emergence, smoltification, maturation period, migratory behavior, competition with other aquatic species, [and] growth and disease resistance" (CSRI 1997). One survey found that over 60% of the 2,658 stream miles surveyed in Oregon that did *not* meet the state standard for water temperature were found in the Rogue and Umpqua River basins (913 stream miles in the Rogue basin, 779 in the Umpqua basin). The Rogue and Umpqua River basins also respectively contained 243 and 296 stream miles of potential concern (CSRI 1997). Other water quality factors of concern are: Low levels of dissolved oxygen (fish need sufficient levels in order to breathe), altered food webs (stable biological communities promote salmonid survival), increased levels of toxic substances (poisons tend to accumulate in sediment and the food chain), pH problems (fish require a certain range of pH and 20% of the stream miles assessed in Oregon are too basic or acidic (CSRI 1997)), low levels of stream fertility (a stream's fertility is directly related to the amount of food it can produce and 640 out of 698 stream miles assessed in Oregon are listed by the Department of Environmental quality as being of potential concern (CSRI 1997)). There are other water quality characteristics that can be measured and may have some affect on salmon, but the above text should make it clear every major water quality parameter is degraded to some extent in the areas inhabited by OC and SONCC coho salmon—and some factors such as water temperature are degraded to a great extent.

As to water quantity, "[d]epletion and storage of . . . flows have altered natural hydrologic cycles occupied by both [the OC and SONCC coho salmon] ESUs. This resulted in juvenile salmonid mortality for a variety of reasons: migration delays [caused by] insufficient flows . . . ; loss of . . . habitat due to dewatering and blockage; [fish] stranding resulting from rapid flow fluctuations; entrainment . . . into poorly screened or unscreened diversions; and . . . increased water temperatures" (NOAA Fisheries 1997). Low water flows also allow more fine sediment to be deposited in salmon habitats and slows spawning gravel recruitment. Low flows are caused primarily by water withdrawals for agricultural and other purposes, and water demand unfortunately often coincides with summer low-flow periods. The problems are endemic up and down the coast and OC and SONCC coho salmon have been adversely affected by them.

Other Factors and Efforts to Address Them

Human activities have adverse effects on salmon habitat beyond the ones listed above. Blockages and passage barriers prevent salmon from using some of the historic habitat. Various activities such as boating, fishing, off-road vehicle use, and livestock movement can disrupt salmon behavior and damage salmon redds, and so forth. Essentially, any human-caused disturbance in salmon country can, and has, affected salmon to some degree. The cumulative impact of these activities and the ones listed above have been enormous throughout the range of both the OC and SONCC coho salmon. However, a number of efforts are now under way throughout Oregon and Northern California to address some of these effects. Please see the Cumulative Effects Analysis section of this Opinion for a list and brief discussion of those efforts.

Hatcheries

The hatchery constituents of the total number of coho produced in various Oregon coastal rivers range from 18% to 62% (ODFW 1995). These estimates are for rivers known to have a high degrees of hatchery influence, but they also represent a substantial portion of the natural coho salmon production habitat in Oregon. Thus, hatchery fish have had an extensive presence in the OC and SONCC ESUs. In recent years, Oregon coast hatcheries have produced substantially fewer coho salmon smolts in response to the coho listings. In 1990 more than 5.3 million smolts were released in Oregon coast streams; in 1998 only 1.4 million smolts were released; and the 1999 release was less than one million smolts (Stratton 1998).

For more than 100 years, hatcheries in the Pacific Northwest have been used to (a) produce fish for harvest and (b) replace natural production lost to dam construction and other development—not to protect and rebuild naturally-produced salmonid populations. As a result, most salmonid populations in the region are primarily derived from hatchery fish, and it is only recently that the substantial effects of hatcheries on native naturally produced populations been demonstrated. For example, the production of hatchery fish, among other factors, has contributed to the 90% reduction in naturally produced coho salmon runs in the Lower Columbia River over the past 30 years (Flagg et al. 1995).

Hatchery fish can harm naturally produced salmon and steelhead in four primary ways: (1) ecological effects, (2) genetic effects, (3) overharvest effects, and (4) masking effects (NOAA Fisheries 2000a). Ecologically, hatchery fish can prey on, displace, and compete with naturally produced fish. These effects are most likely to occur when fish are released in poor condition and do not migrate to marine waters, but rather remain in the streams for extended rearing periods. Hatchery fish also may transmit hatchery-borne diseases, and hatcheries themselves may release disease-carrying effluent into streams. Hatchery fish can affect the genetic composition of native fish by interbreeding with them. Interbreeding can also result from the introduction of native stocks from other areas. Theoretically, interbred fish are less adapted to the local habitats where the original native stock evolved and are therefore less productive there.

In many areas, hatchery fish provide increased fishing opportunities. However, when naturally produced fish mix with hatchery stock in these areas, smaller or weaker naturally produced stocks can be over harvested. Moreover, when migrating adult hatchery and naturally produced fish mix on the spawning grounds, the health of the naturally produced runs and the habitat's ability to support them can be overestimated because the hatchery fish mask the surveyors' ability to discern actual natural run conditions.

Harvest

Salmon have been harvested along the coast of Oregon for as long as people have lived there. Commercial fishing developed rapidly with the arrival of European settlers and the advent of canning technologies in the late 1800s. The development of non-Indian fisheries began around this time and commercial fishing was an important economic activity soon after. The early commercial fisheries used gill nets, seines hauled from shore, traps, and fish wheels. Later, purse seines and trolling (using hook and line) fisheries developed. Recreational (sport fishing) harvest began in the late 1800s, occurring primarily in tributary locations (ODFW and WDFW 1998).

Overfishing in non-tribal fisheries is believed to have been a significant factor in the decline of coho salmon. This included significant overfishing that occurred from the time marine survival turned poor for many stocks until the mid-1990s when harvest was substantially curtailed (May 6, 1997; 62 FR 24588). Since 1994, the retention of coho salmon has been prohibited in marine fisheries south of Cape Falcon, Oregon. Coho salmon are still impacted however, as a result of hook-and-release mortality in chinook salmon-directed fisheries. Since 1970, the ocean exploitation rates for Oregon Production Index coho salmon stocks (including coho salmon ESUs listed under the ESA) have generally declined from a high of about 80% to less than 10% in recent years. This has resulted from implementing non-retention fisheries of the Oregon and California coasts. Ocean harvest also affects listed salmonids. For example, at one point it was estimated that unauthorized high seas drift net fisheries harvested between 2% and 38% of the steelhead destined to return to the Pacific Coast of North America (Cooper and Johnson 1992). However, since drift nets were outlawed in 1987, and enforcement has increased, that percentage has certainly decreased greatly. Therefore, while some ocean fisheries affect west coast coho salmon, it is indeterminable to what degree—though it is probably a fairly minor one in comparison to the effects arising from other sources. Sport and commercial fishing restrictions ranging from severe curtailment to complete closures of these fisheries in recent years may be providing an increase in adult coho salmon spawners in some streams, but trends cannot be established from the existing data. Conservation concerns for naturally-produced runs of salmon and steelhead have resulted in current harvest regulations in Oregon that limit the numbers of fish anglers can capture per day and per year. In addition these fisheries specifically target hatchery fish.

The annual tribal harvest of coho salmon over the past five years has been reported as 670 fish, of which an average of 70 may have been naturally produced. If the minimum population of naturally produced SONCC coho salmon is about 10,000 fish (Weitkamp et al. 1995), the tribal impact on listed coho salmon has been relatively small, on average less than 100 fish per year during the past six years and thus less than 1% of the SONCC coho salmon ESU. Estimated tribal harvest rates on Klamath Basin coho salmon averaged 5% from 1992-1997. There are no tribal fisheries on coho salmon populations in the Rogue, Smith, Eel, or Mattole Rivers.

Salmonids' capacity to produce more adults than are needed for spawning offers the potential for sustainable harvest of naturally-produced fish. This potential can be realized only if two basic management requirements are met: (1) enough adults return to spawn and perpetuate the run, and (2) the productive capacity of the habitat is maintained. Catches may fluctuate in response to such variables as ocean productivity cycles, periods of drought, and natural disturbance events, but as long as the two management requirements are met, fishing may be sustained indefinitely. Unfortunately, both prerequisites for sustainable harvest have been violated routinely in the past. The lack of coordinated management across jurisdictions, combined with competitive economic pressures to increase catches or to sustain them in periods of lower production, resulted in harvests that were too high and escapements that were too low. At the same time, habitat has been increasingly degraded, reducing the salmon stocks' capacity to produce numbers in excess of their spawning escapement requirements.

For years, the response to declining catches was hatchery construction to produce more fish. Because hatcheries require fewer adults to sustain their production, harvest rates in the fisheries were allowed to remain high, or even increase, further exacerbating the effects of overfishing on the naturally produced runs mixed in the same fisheries. More recently, harvest managers have instituted reforms including weak stock, abundance-based, harvest rate, and escapement-goal management. As with improvements being made in other phases of the life histories, it will take some time for these (and future) measures to contribute greatly to the species recovery, but the effort has begun.

Direct Take

There are several activities that contribute to direct take, none of which have been throughly documented. Development of all kinds has facilitated access to coastal salmonid habitats—increasing actual and potential take by people, vehicles, and livestock. Anecdotal reports indicate that poaching is severe on some coastal stream reaches in Oregon. Direct mortality of salmon from unscreened water diversions has the potential to kill many young salmon and some adults. Instream work such as replacement of culverts can have similar effects if not done at the proper time of year or in a location that minimizes potential to kill salmon. Another means of direct mortality is the elimination of spawning or rearing areas caused by reservoir inundation (CSRI 1997).

Natural Conditions

Natural changes in the freshwater and marine environments play a major role in salmonid abundance. Recent evidence suggests that marine survival among salmonids fluctuates in response to 20- to 30-year cycles of climatic conditions and ocean productivity (Hare et al. 1999). This phenomenon has been referred to as the Pacific Decadal Oscillation. In addition, large-scale climatic regime shifts, such as El Niño, appear to change ocean productivity. During the first part of the 1990s, much of the Pacific Coast was subject to a series of very dry years. More recently, severe flooding has adversely affected some stocks (e.g., the low returns of Lewis River bright fall chinook salmon in 1999). Since that time, ocean conditions have improved somewhat, but another El Nino year is predicted for late 2002 through late 2003.

A key factor affecting many West Coast stocks has been a general 30-year decline in ocean productivity. The mechanism whereby stocks are affected is not well understood, partially because the pattern of response to these changing ocean conditions has differed among stocks, presumably due to differences in their ocean timing and distribution. It is presumed that survival is driven largely by events occurring between ocean entry and recruitment to a subadult life stage. One indicator of early ocean survival can be computed as a ratio of coded-wire tag (CWT) recoveries from subadults relative to the number of CWTs released from that brood year. For example, time-series of survival rate information for Upper Willamette River spring chinook salmon, Lewis River fall chinook salmon, and Skagit fall chinook salmon show highly variable or declining trends in early ocean survival, with very low survival rates in the late 1990s (NOAA Fisheries 2000a).

Salmon and steelhead are exposed to high rates of natural predation, particularly during freshwater rearing and migration stages. Ocean predation may also contribute to significant natural mortality, although it is not known to what degree. In general, salmonids are prey for pelagic fishes, birds, and marine mammals, including harbor seals, sea lions, and killer whales. There have been recent concerns that the rebound of seal and sea lion populations—following their protection under the Marine Mammal Protection Act of 1972—has caused a substantial number of salmonid deaths. In recent years, for example, sea lions have learned to target Upper Willamette River spring chinook salmon in the fish ladder at Willamette Falls (NOAA Fisheries 2000a).

It should also be noted that the unusual drought conditions in 2001 warrant consideration. The available water in Oregon river basins was 50-60% of normal and resulted in some of the lowest flow conditions on record. The juveniles that passed downriver during the 2001 spring and summer out-migration were likely affected and this, in turn, will affect adult returns primarily in 2003 and 2004, depending on the stock and species. At this time, it is impossible to ascertain what those effects will be, but NOAA Fisheries is monitoring the situation and will take the drought condition into account in management decisions, including amending take authorizations and other permit conditions as needed.

Scientific Research

ESA-listed and other fish in the coastal waters of Oregon and California are the subject of scientific research and monitoring activities, and most biological opinions NOAA Fisheries issues recommend specific monitoring, evaluation, and research efforts intended to help gather information that would be used to increase the survival of listed fish. In addition, NOAA Fisheries has issued numerous research permits authorizing takes of ESA-listed fish over the last few years. Currently, there are approximately 64 research actions taking place that affect OC coho; these were authorized under section 4(d) of the ESA (NOAA Fisheries 2002b). (There are also a few proposed 4(d) research actions that may affect SONCC coho, but they have not yet received approval.) The five research actions considered here that may affect OC coho would be added to this number—making a total of 69 research actions. It should be noted that none of these take authorizations, by itself, has the potential to lead to the decline of the species. However the sum of the authorized takes indicates a high level of research effort in the action area and, as anadromous fish stocks have continued to decline, the proportion of fish handled for research/monitoring purposes has increased. The effect of these activities is difficult to assess because despite the fact that fish are harassed and even killed in the course of scientific research, these activities have a great potential to benefit ESA-listed salmon. For example, aside from simply increasing what is known about the listed species and their biological requirements, research is essentially the only way to answer key questions associated with difficult resource issues that crop up in every management arena and involve every salmonid life history stage (particularly the resource issues discussed in the previous sections). Perhaps most importantly, the information gained during research and monitoring activities will help resource managers recover listed species. That is, no rational resource allocation or management decisions can be made without the knowledge to back them up. Further, there is no way to tell if a particular corrective measure is working unless it is monitored, and no way to design new and better ones if research is not done.

In any case, scientific research and monitoring efforts (unlike the other factors described in the previous sections) are not considered to be a factor contributing to the decline of listed salmonids, and NOAA Fisheries believes that the information derived from the research activities is essential to their survival and recovery. Nonetheless, fish *are* harmed during research activities. And activities that are carried out in a careless or undirected fashion are not likely to benefit the species at all. Therefore, to reduce adverse effects from research activities on the species, NOAA Fisheries imposes conditions in its permits so that permit holders conduct their activities in such a way as to minimize adverse effects on the ESA-listed species, including keeping mortalities as low as possible. Also, researchers are encouraged to use non-listed fish species and hatchery fish instead of listed naturally-produced fish when possible. In addition, researchers are encouraged to share fish samples, as well as the results of the scientific research, with other researchers and co-managers in the region as a way to avoid duplicative research efforts and to acquire as much information as possible from the ESA-listed fish sampled. NOAA Fisheries also works with other agencies to coordinate research and thereby prevent duplication of effort.

Summary

In conclusion, the picture of whether OC and SONCC coho salmon biological requirements are being met is more clear-cut for habitat-related parameters than it is for population factors: given all the factors for decline—even taking into account the corrective measures being implemented—it is still clear that the OC and SONCC coho salmon's biological requirements are currently not being met under the environmental baseline. Thus their status is such that there must be a significant improvement in the environmental conditions of their habitat (over those currently available under the environmental baseline). Any further degradation of the environmental conditions could have a large impact because the species is already at risk. In addition, there must be efforts to minimize impacts caused by harvest, hatchery operations, habitat degradation, and unfavorable natural conditions.

EFFECTS OF THE ACTION

The purpose of this section is to identify the effects NOAA Fisheries' issuance of scientific research permits will have on threatened OC and SONCC coho salmon. To the extent possible, this will include analyses of effects at the population level. Where information on these listed salmonids is lacking at the population level, this analysis assumes that the status of each affected population is the same as the ESU as a whole. The method NOAA Fisheries uses for evaluating effects is discussed first, followed by discussions of the general effects that scientific research activities are known to have (including the effects arising from mitigation efforts) and permit-specific effects.

Evaluating the Effects of the Action

Over the course of the last decade and hundreds of ESA section 7 consultations, NOAA Fisheries developed the following four-step approach for applying the ESA Section 7(a)(2) standards when determining what effect a proposed action is likely to have on a given listed species. What follows here is a summary of that approach[1].

1. Define the biological requirements and current status of each listed species.

2. Evaluate the relevance of the environmental baseline to the species' current status.

3. Determine the effects of the proposed or continuing action on listed species and their habitat.

4. Determine whether the species can be expected to survive with an adequate potential for recovery under (a) the effects of the proposed (or continuing) action, (b) the effects of the environmental baseline, and (c) any cumulative effects—including all measures being taken to improve salmonid survival and recovery.

The fourth step above requires a two-part analysis. The first part focuses on the action area and defines the proposed action's effects in terms of the species' biological requirements in that area (i.e., impacts on essential habitat features). The second part focuses on the species itself. It describes the action's impact on individual fish—or populations, or both—and places that impact in the context of the ESU as a whole. Ultimately, the analysis seeks to answer the questions of

[1]For more detail please see pages 4-10 of *The Habitat Approach: Implementation of Section 7 of the Endangered Species Act for Actions Affecting the Habitat of Pacific Salmonids* (NOAA Fisheries 1999).

whether the proposed action is likely to jeopardize a listed species' continued existence or destroy or adversely modify its critical habitat.

Effects on Critical Habitat

Previous sections have detailed the circumstances surrounding the designation of critical habitat for SONCC coho salmon and OC coho salmon (and the subsequent vacating of a critical habitat for the latter), described the essential features of that habitat, and depicted its present condition. The discussion here focuses on how those features of critical habitat for SONCC coho salmon are likely to be affected by the proposed actions.

Full descriptions of the proposed activities are found in the next section. In general, the activities will be (a) electrofishing—using both backpack- and boat-based equipment, (b) streamside and snorkel surveys in spawning and rearing habitat, and (c) capturing fish with angling equipment, traps, and nets of various types. All of these techniques are minimally intrusive in terms of their effect on habitat. None of them will measurably affect any of the 10 essential fish habitat features listed earlier (i.e., stream substrates, water quality, water quantity, food, streamside vegetation, etc.). Moreover, the proposed activities are all of short duration. Therefore, NOAA Fisheries concludes that the proposed activities are unlikely to destroy or adversely modify OC or SONCC habitat—including critical habitat.

Effects on OC and SONCC Coho Salmon

The primary effects the proposed activities will have on OC and SONCC coho salmon will occur in the form of direct "take" (the ESA take definition is given in the previous section marked "Individual Permits"), usually in the form of harassment. Harassment generally leads to stress and other sublethal effects and is caused by observing, capturing, and handling fish. The ESA does not define harassment nor has NOAA Fisheries defined this term through regulation pursuant to the ESA. However, the USFWS defines harassment as "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to breeding, feeding or sheltering" [50 CFR 17.3]. For the purposes of this analysis, NOAA Fisheries adopts this definition of harassment.

The various proposed activities, described under "Permit-specific Effects," would cause many types of take, and while there is some blurring of the lines between what constitutes an activity (e.g., electrofishing) and what constitutes a take category (e.g., harm), it is important to keep the two concepts separate. The reason for this is that the effects being measured here are those which the activity itself has on the listed species. They may be expressed in *terms* of the take categories (e.g., how many listed salmonids are harmed, or harassed, or even killed), but the actual mechanisms of the effects themselves (i.e., the activities) are the causes of whatever take arises and, as such, they bear examination. Therefore, the first part of this section is devoted to a discussion of the general effects known to be caused by the proposed activities, regardless of where they occur or what species are involved.

The following subsections describe the types of activities being proposed. Because they would all be carried out by trained professionals using established protocols and have widely recognized specific impacts, each activity is described in terms broad enough to apply to every proposed permit. This is especially true in light of the fact that the researchers would not receive a permit unless their activities (e.g., electrofishing) incorporate NOAA Fisheries' uniform, pre-established set of mitigation measures. These measures are described in the previous section marked "Common Elements Among the Proposed Actions." They are incorporated (where relevant) into every permit as part of the terms and conditions to which a researcher must adhere.

Observation

For some studies, ESA-listed fish will be observed in-water (i.e., snorkel surveys). Direct observation is the least disruptive and simplest method for determining presence/absence of the species and estimating their relative abundance. Its effects are also generally the shortest-lived among any of the research activities discussed in this section. Typically, a cautious observer can effectively obtain data without disrupting the normal behavior of a fish. Fry and juveniles frightened by the turbulence and sound created by observers are likely to seek temporary refuge behind rocks, vegetation, and deep water areas. In extreme cases, some individuals may temporarily leave the particular pool or habitat type when observers are in their area. Researchers minimize the amount of disturbance by moving through streams slowly—thus allowing ample time for fish to reach escape cover. It should be noted that the research may at times involve observing adult fish—which are more sensitive to disturbance. During some of the research activities discussed below, redds may be visually inspected, but no redds will be walked on. Harassment is the primary form of take associated with these observation activities, and few if any injuries or deaths are expected to occur—particularly in cases where the observation is to be conducted solely by researchers on the stream banks rather than in the water. There is little a researcher can do to mitigate the effects associated with observation activities because those effects are so minimal. In general, all they can do is move with care and attempt to avoid disturbing sediments, gravels, and, to the extent possible, the fish themselves.

Capture/handling

Capturing and handling fish causes them stress—though they typically recover fairly rapidly from the process and therefore the overall effects of the procedure are generally short-lived. The primary contributing factors to stress and death during handling are excessive doses of anesthetic, differences in water temperatures (between the river and wherever the fish are held), dissolved oxygen conditions, the amount of time the fish are held out of the water, and physical trauma. Stress on salmonids increases rapidly from handling if the water temperature exceeds 18°C or dissolved oxygen is below saturation. Fish that are transferred to holding tanks can experience trauma if care is not taken in the transfer process, and fish can experience stress and injury from overcrowding in traps if the traps are not emptied on a regular basis. Debris buildups at traps can also kill or injure fish if the traps are not monitored and cleared on a regular basis.

Based on prior experience with the research techniques and protocols that would be used to conduct the proposed scientific research, no more than 5% of the juvenile salmonids encountered are likely to be killed as an indirect result of being captured and handled and, in most cases, that figure will not exceed 3%. In addition, it is not expected that more than 1% of the adults being handled will die. In any case, all researchers will employ the mitigation measures described earlier in the section marked "Common Elements Among the Proposed Actions" and thereby keep adverse effects to a minimum. Finally, any fish indirectly killed by the research activities in the proposed permits may be retained as reference specimens or used for analytical research purposes.

Electrofishing

Electrofishing is a process by which an electrical current is passed through water containing fish in order to stun them—thus making them easy to capture. It can cause a suite of effects ranging from simple harassment to actually killing the fish (adults and juveniles) in an area where it is occurring. The amount of unintentional mortality attributable to electrofishing may vary widely depending on the equipment used, the settings on the equipment, and the expertise of the technician. Electrofishing can have severe effects on adult salmonids. Spinal injuries in adult salmonids from forced muscle contraction have been documented. Sharber and Carothers (1988) reported that electrofishing killed 50% of the adult rainbow trout in their study. The long-term effects electrofishing has on both juveniles and adult salmonids are not well understood, but long experience with electrofishing indicates that most impacts occur at the time of sampling and are of relatively short duration.

The effects electrofishing will have on the listed salmonids under this consultation would be limited to the direct and indirect effects of exposure to an electric field, capture by netting, holding captured fish in aerated tanks, and the effects of handling associated with transferring the fish back to the river (see the next subsection for more detail on capturing and handling effects). Most of the studies on the effects of electrofishing on fish have been conducted on adult fish greater than 300 mm in length (Dalbey et al. 1996). The relatively few studies that have been conducted on juvenile salmonids indicate that spinal injury rates are substantially lower than they are for large fish. Smaller fish intercept a smaller head-to-tail potential than larger fish (Sharber and Carothers 1988) and may therefore be subject to lower injury rates (e.g., Hollender and Carline 1994, Dalbey et al. 1996, Thompson et al. 1997). For example, McMichael et al. (1998) found a 5.1% injury rate for juvenile MCR steelhead captured by electrofishing in the Yakima River subbasin. The incidence and severity of electrofishing damage is partly related to the type of equipment used and the waveform produced (Sharber and Carothers 1988, McMichael 1993, Dalbey et al. 1996, Dwyer and White 1997). Continuous direct current (DC) or low-frequency ($\leq$30 Hz) pulsed DC have been recommended for electrofishing (Fredenberg 1992, Snyder 1992 and 1995, Dalbey et al. 1996) because lower spinal injury rates, particularly in salmonids, occur with these waveforms (Fredenberg 1992, Taube 1992, McMichael 1993, Sharber et al. 1994, Dalbey et al. 1996). Only a few recent studies have examined the long-term effects of electrofishing on salmonid survival and growth (Ainslie et al. 1998, Dalbey et al. 1996, Taube 1992). These studies indicate that although some of the fish suffer spinal injury, few die as a result. However, severely injured fish grow at slower rates and sometimes they show no growth at all (Dalbey et al. 1996).

NOAA Fisheries' electrofishing guidelines (NOAA Fisheries 2000b) will be followed in all surveys requiring this procedure. The guidelines require that field crews be trained in observing animals for signs of stress and shown how to adjust electrofishing equipment to minimize that stress. Electrofishing is used only when other survey methods are not feasible. All areas for stream and special needs surveys are visually searched for fish before electrofishing may begin. Electrofishing is not done in the vicinity of redds or spawning adults. All electrofishing equipment operators are trained by qualified personnel to be familiar with equipment handling, settings, maintenance, and safety. Operators work in pairs to increase both the number of fish that may be seen and the ability to identify individual fish without having to net them. Working in pairs also allows the researcher to net fish before they are subjected to higher electrical fields. Only DC units will be used, and the equipment will be regularly maintained to ensure proper operating condition. Voltage, pulse width, and rate will be kept at minimal levels and water conductivity will be tested at the start of every electrofishing session so those minimal levels can be determined. Due to the low settings used, shocked fish normally revive instantaneously. Fish requiring revivification will receive immediate, adequate care.

The preceding discussion focused on the effects of using a backpack unit for electrofishing and the ways those effects will be mitigated. It should be noted, however, that in larger streams and rivers electrofishing units are sometimes mounted on boats. These units often use more current than backpack electrofishing equipment because they need to cover larger (and deeper) areas and, as a result, can have a greater impact on fish. In addition, the environmental conditions in larger, more turbid streams can limit researchers' ability to minimize impacts on fish. For example, in areas of lower visibility it is difficult for researchers to detect the presence of adults and thereby take steps to avoid them. Because of its greater potential to harm fish, and because NOAA Fisheries has not published appropriate guidelines, boat electrofishing has not been given a general authorization under NOAA Fisheries' recent ESA section 4(d) rules. However, it is expected that guidelines for safe boat electrofishing will be in place in the near future. And in any case, all researchers intending to use boat electrofishing will use all means at their disposal to ensure that a minimum number of fish are harmed (these means will include a number of long-established protocols that will eventually be incorporated int NOAA Fisheries' guidelines).

Tagging/marking

Techniques involving tagging and marking fish are common to many scientific research efforts using ESA-listed species. All sampling, handling, and tagging procedures have an inherent potential to stress, injure, or even kill the marked fish. This section discusses the marking process some of the researchers propose to use and its associated risks.

Fin clipping is the process of removing all or parts of one or more fins to alter a fish's appearance and thus make it identifiable. When entire fins are removed, it is expected that they will never grow back. Alternatively, a permanent mark can be left when only a part of the fin is removed or the ends of a fin or a few fin rays are clipped. Although researchers have used all fins for marking at one time or another, the current preference is to clip the adipose, pelvic, or pectoral fins. Marks can also be made by punching holes or notches in fins, severing individual fin rays (Welch and Mills 1981), or removing single prominent fin rays (Kohlhorst 1979). Many studies have examined the effects of fin clips on fish growth, survival, and behavior. The results of these studies are somewhat variable; however, it can be said that fin clips do not generally alter fish growth. Studies comparing the growth of clipped and unclipped fish generally have shown no differences between them (e.g., Brynildson and Brynildson 1967). Moreover, wounds caused by fin clipping usually heal quickly—especially those caused by partial clips.

Mortality among fin-clipped fish is also variable. Some immediate mortality may occur during the marking process, especially if fish have been handled extensively for other purposes (e.g., stomach sampling). Delayed mortality depends, at least in part, on fish size. Small fishes have often been found to be susceptible to it and Coble (1967) suggested that fish shorter than 90 mm are at particular risk. The degree of mortality among individual fishes also depends on which fin is clipped. Studies show that adipose- and pelvic-fin-clipped coho salmon fingerlings have a 100% recovery rate (Stolte 1973). Recovery rates for steelhead were 60% when the adipose fin was clipped and 52% when the pelvic fin was clipped and dropped markedly when the pectoral, dorsal, and anal fins were clipped (Nicola and Cordone 1973). Clipping the adipose and pelvic fins probably kills fewer fish because these fins aren't used much for movement or balance (McNeil and Crossman 1979). Mortality is generally higher when the major median and pectoral fins are clipped. Mears and Hatch (1976) showed that clipping more than one fin may increase delayed mortality, but other studies have been less conclusive.

Regardless, any time researchers clip or remove fins, it is necessary that the fish be handled. Therefore, researchers must follow safe and sanitary conditions required to minimize stress and injury to listed fish.

<u>Sacrifice</u>

In some instances, it is necessary to kill a captured fish in order to gather whatever data a study is designed to produce. In such cases, determining effect is a very straightforward process: the sacrificed fish, if juveniles, are forever removed from the ESU's gene pool; if the fish are adults, the effect depends upon whether they are killed before or after they have a chance to spawn. If they are killed after they spawn, there is very little overall effect. Essentially, it amounts to removing the nutrients their bodies would have provided to the spawning grounds. If they are killed before they spawn, not only are they removed from the ESU, but so are all their potential progeny. Thus, killing pre-spawning adults has the greatest potential to affect their ESU and, because of this, NOAA Fisheries rarely allows it to happen. And, in almost every instance where it is allowed, the adults are stripped of sperm and eggs so their progeny can be raised in a controlled environment such as a hatchery—thereby greatly decreasing the potential harm posed by sacrificing the adults. Clearly, there is no way to mitigate the effects of sacrificing a fish.

Permit-specific Effects

The ODFW releases a report annually that estimates adult spawner abundance of OC coho salmon and SONCC coho salmon in the state of Oregon from surveys and dam counts (ODFW 2002b). From the 1999 adult spawner abundance estimates, it is possible to make rough estimates of juvenile outmigration for 2002 (see the table below). The number of eggs deposited was estimated by assuming a 50:50 sex ratio and 2,500 eggs per female. Fry were calculated to be 65% of egg deposition. To estimate parr numbers, adults were assumed to spawn in high quality habitat (Nickelson and Lawson 1997) until fully seeded. Any adults in excess of full seeding were assumed to spawn in moderate quality habitat. Egg to parr survival was then based on the relative seeding level of each habitat category and the equations of Nickelson and Lawson (1997). Parr abundance was estimated by multiplying survival rate by egg deposition. Smolt abundance was estimated by multiplying number of summer parr by an overwintering survival rate of 0.20 (Nickelson and Lawson 1997). The adult escapement estimates for SONCC coho and OC coho were taken from ODFW (2002a) and ODFW (2002b), respectively.

ESU	2001 Adult Escapement Estimates	2002 Juvenile Outmigration Estimates
OC coho salmon	149,058	13,082,095
SONCC coho salmon	12,213	397,248

Permit 1140 Modification 2

Permit 1140, modification 2, would authorize the NWFSC to use seines and nets to capture and lethally take up to 200 juvenile OC coho salmon in selected coastal estuaries in Oregon.

Permit #	ESU	Sacrifice Adult	Juvenile
1140	OC coho		200

The number of fish authorized to be killed represents 0.0015% the 13,082,095 estimated OC coho juvenile outmigrants expected in 2002. This is a negligible loss for the ESU. However there is, of course, no way to mitigate the effects resulting from purposely sacrificing the 200 juveniles. It is NOAA Fisheries' position that whatever adverse effect sacrificing 200 juveniles has on the ESU as a whole will be offset by the knowledge gained from the research and its application toward the recovery of the species.

Permit 1156 Modification 2

Permit 1156, modification 2, would authorize the EPA/Dynamac to use electrofishing to capture up to five juvenile and two adult OC coho salmon and 10 juvenile and two adult SONCC coho salmon Oregon's Umpqua and Rogue Rivers, respectively. Up to one juvenile OC coho salmon and one juvenile SONCC coho salmon may be killed as an indirect result of the research.

Permit #	ESU	Capture/Handle/Release		Indirect Mortality	
		Adult	Juvenile	Adult	Juvenile
1156	OC coho	2	5		1
	SONCC coho	2	10		1

Should any adults be encountered, they will not be handled in any way—merely counted. Any juveniles encountered will be examined and released as soon as they have recovered from effects of being captured. They will not be tissue-sampled or marked, and will only be used to determine the species presence/absence (and their proportionate abundances) at the sample site.

It should be noted that the take numbers above are conservative estimates—none may in fact be killed at all. But even if the maximum one juvenile OC coho salmon and one SONCC coho salmon were to be killed, the effect would be negligibly small amidst the estimated 13,082,095 outmigrating from the OC coho ESU and the 397,248 outmigrating from the SONCC ESU.

The researchers will use ODFW district biologist expertise to reduce encounters with listed species. To minimize electrofishing injury, the researchers will use a low pulse rate (30 pulses/s), a narrow pulse width (< 6 msec), and a low peak voltage (500 V). These settings minimize harm to larger fish and, though they are not as effective for collecting small fish, they do stimulate benthic species to move up in the water column where they are more easily netted. For the raft-mounted electrofishing gear, the researchers will employ large cathodes (20 droppers) and six anode droppers to reduce the field strength in the vicinity of the electrodes and use lower voltages. Stunned fish will be recovered using a soft mesh dipnet and placed in a holding tank. Following the data collection, the fish will be placed back in the holding tank to recover before being released alive. If it is observed that juvenile salmonids are being harmed, the researchers will increase the pulse rate (which decreases the potential damage to small fish but increases the potential threat to larger fish). If large and small salmonids are present and the small individuals show evidence of injury, the researchers will shorten the holding time in the live well. All operators of electrofishing equipment will be fully trained.

<u>Permit 1177 Modification 1</u>

Permit 1177, modification 1, would authorize the Portland District USACE to capture 1,600 adult SONCC coho salmon at a weir below Elk Creek Dam on the Rogue River in Oregon and anesthetize and transport them to a point above the dam. The researchers will also examine the carcasses of 45 more adult SONCC coho. In addition, up to 300 juvenile coho salmon will be observed during snorkel surveys. Up to 10 adult SONCC coho salmon may be killed as an indirect result of the trap and haul activities.

Permit #	ESU	Capture/Handle/Release		Indirect Mortality	
		Adult	Juvenile	Adult	Juvenile
1177	SONCC coho	1,600		10	

The potential loss of 10 SONCC coho salmon during the course of these activities would represent 0.08% of the expected returns for this ESU. The effect of this small a loss is essentially unmeasurable. However, it *is* a loss. Nonetheless, it is NOAA Fisheries' contention that the benefit of transporting returning adult salmon above Elk Creek Dam (an impassible barrier) so that they may use habitat upstream of the dam for natural spawning, more than mitigates any adverse effects the activity may have. This program has great potential to increase the levels of natural coho salmon production in the Elk Creek Basin, and therefore it is expected that the overall effect will be a positive one.

Permit 1256

Permit 1256 would authorize the BLM to use backpack electrofishing, seines, dipnets, and rotary traps to capture up to 1,500 juvenile OC coho salmon for stream habitat surveys in the Smith and Siuslaw Rivers and their tributaries in Oregon. In addition, 250 listed coho will be marked with a dye. Up to 10 juvenile OC coho salmon may be killed as an indirect result of the research.

Permit #	ESU	Capture/Handle/Release		Capture/Tag/Release		Indirect Mortality	
		Adult	Juvenile	Adult	Juvenile	Adult	Juvenile
1256	OC coho		1,500		250		10

The researchers would collect data throughout the year (though the rotary trap would only operate from February through the first of June). Researchers will use all due care (and the previously described mitigation measures) to ensure that any captured salmonids are returned to the river safely. Also, NOAA Fisheries' electrofishing guidelines will be followed. The 10 juvenile salmon that may be killed during the course of this research would represent only a very small fraction of the estimated 13,082,095 juveniles outmigrating from the Oregon Coast. The amount is so small that it is not likely to have any measurable effect whatsoever on the ESU.

Permit 1318

Permit 1318 would authorize the ODFW to use boat electrofishing, beach seines, mid-water trawls, and gill nets to capture up to 430 juvenile OC coho salmon. The take would occur during one of several statewide research projects that will sample OC coho salmon. Up to 43 juvenile OC coho salmon may be killed as an indirect result of the capture and handling process.

Permit #	ESU	Capture/Handle/Release		Indirect Mortality	
		Adult	Juvenile	Adult	Juvenile
1318	OC coho		430		43

Juvenile salmonids will be captured, identified by species, allowed to recover in a live well, and released. No adults will be captured. In addition, researchers will closely monitor all captured fish to determine the ideal equipment settings to avoid injuring salmonids. The juvenile outmigration estimate for OC coho is 13,082,095. The 43 fish that may be killed constitute a minuscule portion of the ESU—around 0.003%—and therefore the research will have a negligible effect on the ESU as a whole.

Permit 1336

Permit 1336 would authorize the PBF to use backpack electrofishing and dipnets to capture up to 50 juvenile OC coho salmon in various lakes, rivers, and creeks in Douglas and Coos counties in Oregon. Up to one juvenile OC coho salmon may be killed as an indirect result of the research.

Permit #	ESU	Capture/Handle/Release		Indirect Mortality	
		Adult	Juvenile	Adult	Juvenile
1336	OC coho		50		1

The one juvenile OC coho salmon that may be killed would represent a negligible portion of the 13,082,095 fish expected to outmigrate in 2002 and thus it's potential death would have no measurable adverse effect on the ESU.

Permit 1358

Permit 1358 would authorize the ODFW to use backpack electrofishing, blocknets, and dipnets to capture up 1,400 juvenile SONCC coho salmon in index and randomly selected sites on the Rogue River and in other Oregon coastal basins. Up to 28 juvenile SONCC coho salmon may be killed as an indirect result of the research.

Permit #	ESU	Capture/Handle/Release		Indirect Mortality	
		Adult	Juvenile	Adult	Juvenile
1358	SONCC coho		1,400		28

Juvenile salmonids will be captured, identified by species, allowed to recover in a live well, and released. No adults will be captured. In addition, researchers will closely monitor all captured fish to determine the ideal equipment settings to avoid injuring salmonids. The juvenile outmigration estimate for SONCC coho is 397,248. The 28 fish that may be killed constitute a minuscule portion of the ESU outmigration—0.007%—and therefore the research will have no measurable adverse effect on the ESU.

Permit 1359

Permit 1359 would authorize ODFW to use backpack electrofishing, blocknets, and dipnets to capture up to 146 juvenile SONCC coho salmon during the course of scientific research to be conducted at various sites in the Rogue River basin. Up to eight juvenile SONCC coho salmon may be killed as an indirect result of the research.

Permit #	ESU	Capture/Handle/Release Adult	Capture/Handle/Release Juvenile	Indirect Mortality Adult	Indirect Mortality Juvenile
1359	SONCC coho		146		8

Juvenile salmonids will be captured, identified by species, allowed to recover in a live well, and released. No adults will be captured. In addition, researchers will closely monitor all captured fish to determine the ideal equipment settings to avoid injuring salmonids. The juvenile outmigration estimate for SONCC coho is 397,248. The eight fish that may be killed constitute a minuscule portion of the ESU outmigration—0.002%—and therefore the research will have no measurable adverse effect on the ESU.

Cumulative Effects

Cumulative effects include the effects of future state, tribal, local or private actions that are reasonably certain to occur within the action area subject to this consultation. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the Act.

State, tribal and local government actions will likely to be in the form of legislation, administrative rules or policy initiatives. Government and private actions may include changes in land and water uses, including ownership and intensity, any of which could impact listed species or their habitat. Government actions are subject to political, legislative and fiscal uncertainties. These realities, added to the geographic scope of the action area which encompasses numerous government entities exercising various authorities and the many private landholdings, make any analysis of cumulative effects difficult and speculative. This section identifies representative actions that, based on currently available information, are reasonably certain to occur. However, NOAA Fisheries is unable to determine at this time whether any proposals will result in specific actions.

Representative State Actions

Most future actions in Oregon are described in the Oregon Plan for Salmon and Watershed (OPSW). Along with significant harvest and hatchery measures, the OPSW includes the following habitat-related programs designed to benefit salmon and watershed health:

- Oregon Department of Agriculture Water Quality Management plans.

- Oregon Department of Environmental Quality Total Maximum Daily (pollutant) Loads (TMDLs) in targeted basins.
- Oregon Watershed Enhancement Board funding programs for watershed enhancement programs, land and water acquisitions.
- ODFW and Oregon Water Resources Department programs to enhance flow restoration.
- Rogue Valley Council of Governments (RV COG) Water resources department implementing regional-wide efforts to improve the health of Rogue Basin watersheds.

If these programs are actually implemented, there may be some improvement in various habitat features considered important for the listed species. The OPSW also identifies several private and public cooperative programs for improving the environment for listed species. The success of such programs will depend on continued interest and cooperation among the parties involved.

The state of Oregon administers the allocation of water resources within its borders. Most streams in the state are over–appropriated even though water resource development has slowed in recent years. State and local governments are cooperating with each other and Federal agencies to increase environmental protections, including better habitat restoration and hatchery and harvest reforms. NOAA Fisheries also cooperates with the state water resource management agencies in assessing water resource needs in the Oregon coastal river basins and lakes, and in developing flow requirements that will benefit listed fish. During years of low water, however, there could be insufficient flow to meet the needs of the fish. Furthermore, these government efforts could be discontinued or even reduced, so their cumulative effect on listed fish is unpredictable.

In the past, Oregon's economy was heavily dependent on natural resources, with intense resource extraction activity. The economy has changed over the last decade and is likely to continue changing—with less emphasis on large-scale resource extraction and significant growth in other economic sectors. Growth in new businesses is creating urbanization pressures with increased demands for buildable land, electricity, water supplies, waste disposal sites and other infrastructure.

Economic diversification has contributed to population growth and movement in Oregon, a trend likely to continue for the next few decades. Such population trends will place greater demands in the action area for electricity, water, and buildable land; affect water quality directly and indirectly; and increase the need for transportation, communication, and other infrastructure development. The impacts associated with economic and population demands will affect habitat features, such as water quality and quantity, that are important to the survival and recovery of the listed species. The overall effect is likely to be negative, unless carefully planned for and mitigated.

Some of the state programs mentioned above are designed to address these impacts. Oregon has a statewide land use planning program with growth management and natural resource protection goals. If the programs continue they may help lessen some of the potential adverse effects identified above.

Local Actions

Local governments will be faced with similar but more direct pressures from population growth and movement. There will be demands for intensified development in rural areas as well as increased demands for water, municipal infrastructure, and other resources. The reaction of local governments to such pressures is difficult to assess at this time without certainty in policy and funding. In the past, local governments in the action area generally accommodated additional growth in ways that adversely affected listed fish habitat. Also, there is little consistency among local governments in dealing with land use and environmental issues so that any positive effects from local government actions on listed species and their habitat are likely to be scattered throughout the action area.

In Oregon, local governments are considering ordinances to address aquatic and fish habitat health impacts from different land uses. Some local government programs, if submitted, may qualify for a limit under the NOAA Fisheries' ESA section 4(d) rule which is designed to conserve listed species. Local governments also may participate in regional watershed health programs, although political will and funding will determine participation and, therefore, the effect actions have on listed species. Overall, without comprehensive and cohesive beneficial programs and the sustained application of such programs, it is likely that local actions will not have measurable positive effects on listed species and their habitat, and may even contribute to further degradation.

Tribal Actions

Tribal governments will continue to participate in cooperative efforts involving watershed and basin planning designed to improve fish habitat. For the same reasons discussed under State and Local Actions, it is difficult to assess what effect changes in Tribal forest and agriculture practices, water resource allocations, and land uses will have with respect to listed fish and their habitat. The earlier discussions related to growth impacts apply also to Tribal government actions. Tribal governments will need to apply comprehensive and beneficial natural resource programs to areas under their jurisdiction to produce measurable positive effects for listed species and their habitat.

Private Actions

The effects of private actions are the most uncertain. Private landowners may convert current use of their lands, or they may intensify or diminish current uses. Individual landowners may voluntarily initiate actions to improve environmental conditions, or they may abandon or resist any improvement efforts. Their actions may be compelled by new laws, or may result from population growth and economic pressures. Changes in ownership patterns will have unknown impacts. Whether any of these private actions will occur is highly unpredictable, and the effects even more so.

Summary

Non-Federal actions are likely to continue affecting the listed species. The cumulative effects in the action area are difficult to analyze considering the large geographic scope of this opinion, the political variation in the action area, the uncertainties associated with government and private actions, and the changing economies of the region. Whether these effects will increase or decrease is a matter of speculation; however, based on the trends identified in this section, the adverse cumulative effects are likely to increase. Although state, tribal and local governments have developed plans and initiatives to benefit listed fish, they must be applied and sustained in a comprehensive way before NOAA Fisheries can consider them “reasonably foreseeable” in its analysis of cumulative effects.

Integration and Synthesis of Effect

OC coho salmon

The vast majority of the OC coho salmon that will be captured, handled, observed, etc., during the course of the proposed research (a total of two adults and 2,235 juveniles) are expected to survive with no long-term effects. Moreover, most capture, handling, and holding methods will be minimally intrusive and of short duration. Because so many of the captured fish are expected to survive the research actions (100% and (approximately) 90% for adults and juveniles, respectively), and because the affected individuals make up such a small portion of the ESU, it is likely that these actions will have no adverse long–term effects at either the population or the ESU level. Therefore, any adverse effects the proposed activities may have on the OC coho salmon must be expressed in terms of the individuals that may be killed during the course of the research.

Table 1. Maximum Annual Takes of Threatened Oregon Coast Coho Salmon

	Adult					Juvenile				
Permit	HANDLE			MORTALITY		HANDLE			MORTALITY	
Action	CFT	C,H,R	C,T/M,R	DIRECT	INDIRECT	CFT	C,H,R	C,T/M,R	DIRECT	INDIRECT
1140									200	
1156		2					5			1
1256							1500	250		10
1318							430			43
1336							50			1
TOTAL		2					1985	250	200	55

KEY: CFT = Collect for Transport; C,H,R = Capture, Handle, Release; C,T/M,R = Capture, Tag/Mark

If the total amount of estimated lethal take of OC coho juveniles in all research activities (255 juveniles) is expressed as a percentage of the 13,082,095 juveniles expected to outmigrate, it constitutes a minuscule loss—0.002%—of the ESU as a whole. Moreover, and for a number of reasons, that number is probably even smaller than that. It is important to remember the fact that every estimate of lethal take for the proposed studies (except for the direct take in Permit 1140) has purposefully been inflated to account for potential accidental deaths and it is therefore likely that fewer than 255 juveniles will be killed by the research. In addition, some of the studies will specifically affect OC coho in the smolt stage, but others will not. These latter studies are described as affecting "juveniles," which means they may affect OC coho yearlings, parr, or even fry (i.e., life stages represented by many more individuals than reach the smolt stage—perhaps as much as an order of magnitude more). Therefore the negligible percent of the OC coho to be lethally taken was derived by (a) overestimating the number of fish likely to be killed and (b) treating each dead OC coho as a smolt when some of them clearly won't be. Thus the actual number of OC coho the research is likely to kill is undoubtedly smaller than two thousandths of a percent of the ESU.

But even if the entire 0.002% of the juvenile OC coho were killed, and they were *all* treated as smolts, it would be very difficult to translate that number into an actual effect on the species. Even if the subject were one adult killed out of a population of fifty thousand (0.002% is another way of expressing the fraction "one fifty-thousandth"), it would be hard to resolve an adverse effect. And in this instance, that effect is even smaller because the loss of a smolt is not equivalent to the loss of an adult in terms of species survival and recovery. This is due to the fact that a great many smolts die before they can mature into adults. In general, something near 90% of all salmon smolts do not survive to return as adults. If this number holds even approximately true for the ESU as a whole, it means that some 90% of the 0.002% figure would likely be killed during the natural course of events. Therefore the research, even in the worst possible scenario, would kill likely the equivalent of one adult out of 500,000—a negligible adverse effect on the ESU.

SONCC coho salmon

The vast majority of the SONCC coho salmon that will be captured, handled, observed, etc., during the course of the proposed research (a total of 1,602 adults and 1,556 juveniles) are expected to survive with no long-term effects. Moreover, most capture, handling, and holding methods will be minimally intrusive and of short duration. Because so many of the captured fish are expected to survive the research actions (more than 98% for both adults and juveniles) it is likely that these actions will have no adverse long–term effects at either the population or the ESU level. Therefore, any adverse effects the proposed activities may have on the OC coho salmon must be expressed in terms of the individuals that may be killed during the course of the research.

Table 2. Maximum Annual Takes of Threatened Southern Oregon/Northern California Coast Coho Salmon

	Adult					Juvenile				
Permit	HANDLE			MORTALITY		HANDLE			MORTALITY	
Action	CFT	C,H,R	C,T/M,R	DIRECT	INDIRECT	CFT	C,H,R	C,T/M,R	DIRECT	INDIRECT
1156		2					10			1
1177	1600				10					
1358							1400			28
1359							146			8
TOTAL	1600	2			10		1556			37

KEY: CFT = Collect for Transport; C,H,R = Capture, Handle, Release; C,T/M,R = Capture, Tag/Mark, Release

If the total amount of estimated lethal take of SONCC coho juveniles in all research activities (37 juveniles) is expressed as a fraction of the 397,248 fish expected to out migrate from the Rogue River Basin, it represents a negligibly small percentage of the ESU as a whole—a maximum of 0.009%. However, and for a number of reasons, that number is probably even smaller. First, it is important to remember the fact that every estimate of lethal take for the proposed studies has purposefully been inflated to account for potential accidental deaths and it is therefore very likely that fewer than 37 juveniles will be killed by the research—possibly many fewer. Also, some of the studies will specifically affect SONCC coho in the smolt stage, but others will not. These latter studies are described as affecting “juveniles”, which means they may target SONCC coho yearlings, parr, or even fry (i.e., life stages represented by many more individuals than reach the smolt stage—perhaps as much as an order of magnitude more). And finally, it is unknown how many smolts actually outmigrate from the entire ESU, but whatever that number is, it is larger than the 397,248 being used here as a proxy. This is because that number includes only those fish that outmigrate from the Rogue River basin, and while they may represent a large part of the ESU—even a majority—they do not constitute the entire ESU. Therefore, the insignificant percentage of lethal take was derived by (a) overestimating the number of fish likely to be killed, (b) treating each dead SONCC coho as a smolt when some of them clearly won't be, and (c) treating the Rogue River basin population as if it constituted the entire ESU.

But even if the entire 0.009% of the juvenile SONCC coho were killed, and they were *all* treated as smolts, it would be very difficult to translate that number into an actual effect on the species. Even if the subject were one adult killed out of a population of ten thousand (0.009% is approximately equal to the fraction "one ten-thousandth"), it would be hard to resolve an adverse effect. And in this instance, that effect is even smaller because the loss of a smolt is not equivalent to the loss of an adult in terms of species survival and recovery. This is due to the fact that a great many smolts die before they can mature into adults. In general, something near 90% of all salmon smolts do not survive to return as adults. If this number holds even approximately true for the SONCC ESU as a whole, it means that some 90% of the 0.009% figure would likely be killed during the natural course of events. Therefore the portions of the research that affect juveniles, even in the worst possible scenario, would kill likely the equivalent of one adult out of 100,000—a negligible adverse effect on the ESU.

Finally, the total of estimated lethal take of adult SONCC coho salmon (10 individuals) represents approximately 0.08% of the 12,213 fish expected to return to the Rogue River Basin to spawn. And, as with the estimates of juvenile take, the number of adult SONCC coho to be killed was intentionally overestimated. Also, it is important to keep in mind that fact that the 12,213 fish returning to the Rogue River basin represent only a part of the ESU as a whole—the greater part, certainly, but not the entire ESU in any case. Therefore, the 10 adults the would be killed constitute a good deal less than one ten-thousandth of the ESU, perhaps as little as half of that number. The net adverse effect of a loss that small would be difficult to determine at the level of the Rogue River population alone; at the ESU level, it is impossible to resolve.

Conclusions

After reviewing the current status of the threatened ESUs under consultation, the environmental baseline for the action area, the effects of the proposed section 10(a)(1)(A) permit actions, and cumulative effects, it is NOAA Fisheries' biological opinion that issuing the proposed permits is not likely to jeopardize the continued existence of threatened OC coho salmon or SONCC coho salmon, nor destroy nor adversely modify their critical habitat.

Coordination with the National Ocean Service

The activities contemplated in this Biological Opinion will not be conducted in or near a National Marine Sanctuary. Therefore, these activities will not have an adverse effect on any National Marine Sanctuary.

Reinitiation of Consultation

Consultation must be reinitiated if the amount or extent of annual takes specified in the permits is exceeded or is expected to be exceeded; new information reveals effects of the actions that may affect the ESA-listed species in a way not previously considered; a specific action is modified in a way that causes an effect on the ESA-listed species that was not previously considered; or a new species is listed or critical habitat is designated that may be affected by the action (50 CFR 402.16).

MAGNUSON-STEVENS ACT ESSENTIAL FISH HABITAT CONSULTATION

"Essential fish habitat" (EFH) is defined in section 3 of the Magnuson-Stevens Act (MSA) as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." NOAA Fisheries interprets EFH to include aquatic areas and their associated physical, chemical and biological properties used by fish that are necessary to support a sustainable fishery and the contribution of the managed species to a healthy ecosystem.

The MSA and its implementing regulations at 50 CFR 600.920 require a Federal agency to consult with NOAA Fisheries before it authorizes, funds or carries out any action that may adversely effect EFH. The purpose of consultation is to develop a conservation recommendation(s) that addresses all reasonably foreseeable adverse effects to EFH. Further, the action agency must provide a detailed, written response NOAA Fisheries within 30 days after receiving an EFH conservation recommendation. The response must include measures proposed by the agency to avoid, minimize, mitigate, or offset the impact of the activity on EFH. If the response is inconsistent with NOAA Fisheries' conservation recommendation the agency must explain its reasons for not following the recommendations.

The objective of this consultation is to determine whether the proposed actions, the funding and issuance of scientific research permits under section 10(a)(1)(A) of the ESA for activities within the state of Oregon is likely to adversely affect EFH. If the proposed actions are likely to adversely affect EFH, a conservation recommendation(s) will be provided.

Identification of Essential Fish Habitat

The Pacific Fishery Management Council (PFMC) is one of eight Regional Fishery Management Councils established under the Magnuson-Stevens Act. The PFMC develops and carries out fisheries management plans for Pacific coast groundfish, coastal pelagic species and salmon off the coasts of Washington, Oregon and California. Pursuant to the MSA, the PFMC has designated freshwater and marine EFH for chinook and coho salmon (PFMC 1999). For purposes of this consultation, freshwater EFH for coho salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently and historically utilized by coho salmon within Washington, Oregon, Idaho, and California. The geographic extent of coho salmon essential habitat includes all waters currently and historically used by coho salmon within the USGS hydrologic units (PFMC 1999). Marine EFH for Pacific coho salmon is defined as all waters between mean high water and 60 km (37 miles) offshore north of Point Conception, California including all estuarine, nearshore and marine waters within the western boundary of the U.S. Exclusive Economic Zone (EEZ), 200 miles offshore.

Proposed Action and Action Area

For this EFH consultation the proposed actions and action area are as described in detail in the ESA consultation above. The actions are the funding and issuance of a number of scientific research permits pursuant to section 10(a)(1)(A) of the ESA. The proposed action area is the Oregon coast, including all river reaches accessible to OC coho salmon and SONCC coho salmon. A more detailed description and identification of EFH for salmon is found in Appendix A to Amendment 14 to the Pacific Coast Salmon Plan (PFMC 1999). Assessment of the impacts to these species' EFH from the above proposed action is based on this information.

Effects of the Proposed Action

Based on information submitted by the action agencies and permit applicants, as well as NOAA Fisheries' analysis in the ESA consultation above, NOAA Fisheries believes that the effects of this action on EFH are likely to be within the range of effects considered in the ESA portion of this consultation.

Conclusion

Using the best scientific information available and based on its ESA consultation above, as well as the foregoing EFH sections, NOAA Fisheries has determined that the proposed actions are not likely to adversely affect Pacific salmon EFH.

EFH Conservation Recommendation

NOAA Fisheries has no conservation recommendations to make in this instance.

Consultation Renewal

The action agencies must reinitiate EFH consultation if plans for these actions are substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for the EFH conservation recommendations (50 CFR Section 600.920(k)).

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